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ABSTRACT

Presented in this report are the results of the feasibility testing of selected micro-teaching and video recording feedback techniques in a laboratory setting designed to simulate vocational teacher education. Volunteer teachers were selected and randomly assigned to three treatment groups in a repeated measurement design to compare the relative effectiveness of three different feedback techniques: (1) face-to-face conference, (2) face-to-face conference with video feedback, and (3) remote audio with video feedback. Twelve teachers, with four in each of the three groups, practiced the skill of introducing a lesson during five 5-minute teaching sessions over a period of 3 weeks and were evaluated by a panel of two judges. Variance analysis at the .05 level revealed no significant difference in performance among the groups over the series of teaching sessions. It was also found that the group receiving face-to-face conference with video feedback increased its performance on teaching session four, while the other two groups decreased their mean performance scores as compared to the mean scores for all groups on teaching session three. It was concluded that all feedback techniques were feasible for field testing, but modifications were recommended in the remote feedback technique. (Author)

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Research and Development Series No. 49

Assessment of Micro-Teaching and Video Recording in Vocational and Technical Teacher Education: Phase I--

An Analysis of Face-to-Face, Video, and Remote Audio Feedback Techniques

The Center for Vocational and Technical Education
The Ohio State University, 1900 Kenny Road, Columbus, Ohio 43210

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RESEARCH AND DEVELOPMENT SERIES NO. 49

ASSESSMENT OF MICRO-TEACHING AND VIDEO RECORDING IN VOCATIONAL AND TECHNICAL TEACHER EDUCATION: PHASE I--

AN ANALYSIS OF FACE-TO-FACE, VIDEO, AND REMOTE AUDIO FEEDBACK TECHNIQUES

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U.S. DEPARTMENT OF
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and Development

PREFACE

This is the first in a series of three tests of selected micro-teaching and video recording techniques designed to facilitate the identification of alternate ways to increase the efficacy of vocational teacher education. The tests were conducted to develop feedback techniques in a laboratory under simulated teacher education conditions. This developmental effort further served as a screening device for the most promising techniques prior to seven demonstration and field testing activities which were part of the project, "Assessment of Micro-Teaching and Video Recording in Vocational and Technical Teacher Education." While this was a small scale feasibility test, we believe vocational and technical teachers and researchers will find the results both interesting and beneficial.

We wish to acknowledge the following Center project personnel: Dr. Calvin J. Cotrell, Principal Investigator; Dr. Charles R. Doty, Associate Investigator; James L. Hoerner, Edward R. Hauck, and Niyazi Karasar, Graduate Research Associates.

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Robert E. Taylor
Director
The Center for Vocational
and Technical Education

FOREWORD

The activity being reported was the first of three feasibility tests completed during the period November, 1967 to June, 1968. These studies were essential to the planning and implementation of seven demonstration and field tests conducted in collaboration with several teacher education institutions in the project, "Assessment of Micro-Teaching and Video Recording in Vocational and Technical Teacher Education." The investigators believe that persons interested in developing and testing feedback techniques for teacher education will find these experiences and materials beneficial.

The investigators wish to thank the panel of judges who volunteered their time to evaluate 60 videotaped teaching sessions. The panel members were Dr. J. Robert Warmbrod, Professor of Agriculture Education, The Ohio State University, and Dr. Elizabeth Ray, Professor of Home Economics, The Pennsylvania State University. Great appreciation is extended to the following persons who volunteered their time to participate as teachers in the study:

Mary Jane Stoll
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Calvin J. Cotrell
Charles R. Doty

TABLE OF CONTENTS

	Page
PREFACE	iii
FOREWORD	v
LIST OF TABLES	ix
LIST OF FIGURES	ix
SUMMARY	xi
CHAPTER	
I. BACKGROUND FOR THE STUDY	3
The Foundation for a Series of Studies	3
Related Studies	4
Purpose and Objectives	4
II. PROCEDURES	7
Teacher Education Feedback Techniques	7
Rationale for Feedback Technique Selection	9
Selection of Participants	10
Schedule of Operation	10
Experimental and Statistical Designs	11
Controls	12
Establishment of the Teacher Education Program Objective	12
The Instrument	12
Equipping the Laboratory	13
III. RESULTS	15
Teachers' Performance	15
Comparative Merits of the Teacher Education Feedback Techniques	15
Summary of Findings on Teachers' Performance	24
Teachers' Reactions	24
Informal Observations	26
IV. CONCLUSIONS AND RECOMMENDATIONS	29
Conclusions	29
Recommendations	30

Page

REFERENCES 31

GLOSSARY OF TERMS 33

APPENDIX A - Critique Form--Introducing a Lesson . . . 37

APPENDIX B - Teacher Questionnaire 41

APPENDIX C - Procedures for Teacher Educators 43

LIST OF TABLES

TABLE		Page
1.	Analysis of Variance, Teachers' Accomplished Scale Mean Scores, Panel of Judges' and Teacher Educators' Combined Ratings	17
2.	Analysis of Variance, Teachers' Degree of Accomplishment Scale Mean Scores, Panel of Judges' and Teacher Educators' Combined Ratings . .	18
3.	Analysis of Variance, Degree of Accomplishment Scale Mean Scores, Panel of Judges' Ratings	20
4.	Teachers' Ratings of Questionnaire Items	25

LIST OF FIGURES

FIGURE		Page
1.	Experimental Design	11
2.	Performance Curves, Accomplished Scale Mean Scores, Panel of Judges' Ratings	19
3.	Performance Curves, Degree of Accomplishment Scale Mean Scores, Panel of Judges' Ratings	19
4.	Performance Curves, Degree of Accomplishment Scale Mean Scores, Teacher Educators' Ratings . . .	22

SUMMARY

Presented in this report are the results of the feasibility testing of selected micro-teaching and video recording feedback techniques in a laboratory setting designed to simulate vocational teacher education. Volunteer teachers were selected and randomly assigned to three treatment groups in a repeated measurement design to compare the relative effectiveness of three different feedback techniques: 1) face-to-face conference, 2) face-to-face conference with video feedback, and 3) remote audio with video feedback. Twelve teachers, with four in each of the three feedback groups, practiced the skill of introducing a lesson during five five-minute teaching sessions over a period of three weeks. Their video-recorded lessons were evaluated by a panel of two judges. The mean performance scores on the skill of introducing a lesson for each of the three groups, derived from panel ratings, were subjected to an analysis of variance test which resulted in no significant differences at the .05 level in performance among the groups over the series of teaching sessions. An exception to this finding was the performance of the feedback groups on session three, which was significantly different at the .01 level. It was also found that the group receiving face-to-face conference with video feedback increased its performance on teaching session four while the other two groups decreased their mean performance scores as compared to the mean scores for all groups on teaching session three.

The participating teachers' suggestions for improving the teacher education techniques and the investigators' informal observations were also reported. It was concluded that all feedback techniques were feasible for field testing, but modifications were recommended in the remote feedback technique.

ASSESSMENT OF MICRO-TEACHING AND VIDEO RECORDING IN VOCATIONAL AND TECHNICAL TEACHER EDUCATION: PHASE I--

AN ANALYSIS OF FACE-TO-FACE, VIDEO, AND REMOTE AUDIO FEEDBACK TECHNIQUES

CHAPTER I

BACKGROUND FOR THE STUDY

Vocational and technical education has been suffering from a shortage of teachers and teacher educators. Preservice programs have not been producing an adequate supply of teachers, according to Venn (1968), and inservice education has been neglected because the number of teachers in the field has been increasing more rapidly than the services for them (Barlow, 1966). Never has the pressure been greater for efficiency in teacher education nor the search for potential solutions to these problems more intense. After receiving reports from Stanford University and other institutions regarding successful applications of micro-teaching and video recording in the improvement of general elementary and secondary teacher education, The Center staff was inspired to consider these innovations (Cotrell, 1966). Consequently, there developed a need for a series of investigations into applications of micro-teaching and video recording as potential methods for improving the efficiency of vocational and technical teacher education.

THE FOUNDATION FOR A SERIES OF STUDIES

Vocational and technical teacher education programs with the resources to provide the laboratory for assessing the values of micro-teaching and video recording were not available in 1967, during the planning stages of this project. Therefore, the first three studies in the project were conducted in simulated teacher education programs at The Center for Vocational and Technical Education. Subsequently, the materials and techniques were screened, refined, and adapted for seven field tests and demonstrations.

It was the investigators' desire to develop and assess the feasibility of preservice and inservice teacher education techniques which would save teacher educators the loss of time traveling to schools and would increase the efficacy of typical vocational teacher education methods classes.

Because its inherent economy allows short teaching sessions and small numbers of students and permits a micro-skill of teaching to be practiced and developed rapidly, the micro-teaching format was regarded as ideal for testing the effects of various teacher

education techniques (Allen and Ryan, 1969). Hence, simulating practice teaching, an internship, or itinerant teacher education conditions was facilitated. Developing the essential instruments, designing, and testing promising teacher education feedback techniques were some of the challenges for this study, which was the first in the series of three efforts required to prepare for field testing.

RELATED STUDIES

A collection of literature on micro-teaching and video recording was started early in the planning stages of the project. The work of Bush and Allen at Stanford University was carefully studied (1964). The principal investigator and associate investigator visited Stanford University to study the micro-teaching activities in the secondary teacher education program in January, 1967 and to participate in a micro-teaching clinic in July, 1967. Dr. Dwight W. Allen, associate professor, and David B. Young, instructor, of Stanford University were engaged as consultants for the detailed planning of the project. Among the literature found most helpful in the planning for the series of studies were the works of Allen (1966), Bush (1966), Childs (1967), Olivero (1964), Schueler, *et al.* (1962), and Wick (1967).

PURPOSE AND OBJECTIVES

Since an orientation of the project staff to micro-teaching, the associated hardware, feedback techniques, and the central thrust of the series of studies were primary concerns, the investigators determined that the best vehicle for achieving these goals would be this pilot study. The purposes of the study were to design and pretest the feasibility of selected teacher education feedback techniques, supporting evaluation instruments, and instructional materials under simulated vocational teacher education conditions. The accomplishment of these purposes was a prerequisite for planned field testing and demonstration activities which were to be collaborative efforts with institutions having the capacity for implementation of the teacher education feedback techniques.

The specific objectives of this particular study can be best communicated through the following questions:

1. What are the comparative merits of the three following teacher education feedback techniques in terms of teacher performance: a) face-to-face conference, b) face-to-face conference with video feedback, and c) remote audio with video feedback?

2. What are the teachers' reactions to the teacher education feedback techniques and the materials being tested in the vocational teacher education program?

3. Are the teacher education feedback techniques feasible for field testing or application in ongoing vocational teacher education programs?

4. Do the teacher educators and an independent panel of judges evaluate teaching performance similarly?

CHAPTER II

PROCEDURES

To obtain evidence to answer the questions central to the objectives of the study, it was necessary to devise a laboratory program which would provide the opportunity to test experimental teacher education techniques under simulated conditions. During a period of three weeks three groups of teachers, with each group experiencing a different teacher education feedback technique, engaged in five teaching sessions. Each teaching session involving four students was a complete lesson, containing an introduction, presentation, application, and evaluation. The first session provided pretest data, the other four consisted of two sets of teaching and reteaching sessions in the micro-teaching format: 1) plan, 2) teach, 3) receive feedback, 4) replan, 5) reteach and 6) receive feedback. The teachers were assisted by teacher educators during the feedback activities (steps three and six) of the micro-teaching cycle. The educational objective of the laboratory program was the development of the skill of introducing a lesson. An instrument (Critique form, see Appendix A) on this teaching skill was used in facilitating and guiding the feedback process and for the teacher educators and the panel of judges' evaluations of the teachers' performance, which generated the data for comparing the three teacher education feedback techniques.

Micro-teaching, therefore, served as the vehicle for the collection of data on the teachers' performance under the three teacher education feedback techniques. Video recording of all teaching sessions provided the means for collecting data on teachers as they progressed through the program. As a result, several yields were made possible. The project staff obtained experience with the micro-teaching process, including video recording techniques, and data were collected on the performance of teachers who were provided with a program of teacher education under the simulated conditions.

TEACHER EDUCATION FEEDBACK TECHNIQUES

The three teacher education techniques selected for the pilot study were variations in the nature of feedback given to teachers: 1) a face-to-face conference, based on the personal observation of the teaching session by the teacher educator; 2) a face-to-face

conference including playback of the video-recorded teaching session; and 3) remote feedback by the teacher educator via audio recording with playback of the video-recorded teaching session.

Since many variables could bias the effect on teacher behavior of the teacher education techniques (treatments), each was planned carefully as follows:

Face-to-face conference. The teacher had a conventional face-to-face conference with the teacher educator, with no video feedback. The teacher educator personally observed the teaching session, which was also video-recorded. Immediately following the teaching session, the teacher, the students, and the teacher educator used the critique form on the skill of introducing a lesson to evaluate the teacher's performance on that skill. The teacher educator quickly reviewed the critique forms collected from the teacher and the students. The students then left the classroom, and the teacher and teacher educator had a 15-minute feedback and analysis session. Following this session the teacher spent 15 minutes replanning the same lesson. After replanning, the teacher taught the revised lesson to a different group of students and had another critique session. This cycle took an hour and a half.

Face-to-face conference plus video feedback. The teacher had a conference with the teacher educator, with video feedback. The teacher educator personally observed the teaching session, which was also video-recorded. Immediately following the teaching session, the teacher, the students, and the teacher educator used the critique form on the skill of introducing a lesson to evaluate the teacher's performance. The teacher educator quickly reviewed the critique forms collected from the teacher and the students. The students then left the classroom, and the teacher and teacher educator viewed the video replay of the teaching session. No comments were made by either during the first viewing; subsequently, the session was analyzed and discussed. Then the teacher spent 15 minutes replanning the same lesson. After replanning, the teacher taught the revised lesson to a different group of students and had another critique session as described above. This cycle lasted one and one-half hours.

Remote audio with video feedback. The teacher received video feedback and teacher educator's comments which were recorded with an audio tape recorder. Except for the delay necessary for the teacher educator to place his comments on the audio tape, the micro-teaching cycle and time factors were the same as for the other two feedback techniques. Since this was a remote teacher education feedback situation, the teacher did not see the teacher educator. However, the teacher educator viewed the teaching session on closed circuit television in a nearby room. After the teaching session, the teacher, the students, and the teacher educator separately evaluated the session. The video recorder operator

collected the critique forms from the teacher and the students and delivered them to the teacher educator. The teacher and students then left the laboratory. The teacher educator reviewed the critique forms, prepared his notes, and recorded his comments on the audio tape recorder. Within three days the teacher returned to the laboratory, viewed his teaching session, and listened to the teacher educator's comments on the audio tape. The teacher then spent 15 minutes replanning the same lesson, taught this lesson to a different group of students, and had another critique session as described above.

RATIONALE FOR FEEDBACK TECHNIQUE SELECTION

The rationale for incorporating the three selected teacher education feedback techniques for the pilot study was quite simple. Since this was the first in a series of studies and the investigators were using this experience to orient the entire project staff to micro-teaching, it was essential to select some of the simplest forms of feedback for use with micro-teaching. Concern that the techniques be applicable in inservice as well as preservice teacher education programs led to the inclusion of the remote supervision technique. Since the simplest form of micro-teaching can operate without video recording as part of the feedback and there was need for a control group for the comparative study of the feedback techniques, the conventional face-to-face conference without video feedback was also included.

The most popular form of micro-teaching in general elementary and secondary teacher education incorporated video feedback; therefore, the face-to-face conference with video feedback was selected as the second feedback technique to be tested. Incorporating this feedback technique made it possible to determine the impact of video feedback on teacher performance in this program. Both of the face-to-face techniques have wide application in various forms of preservice teacher education such as methods classes and preservice workshops.

The third technique, a form of remote supervision, was selected because of the concern for finding and testing a means for providing inservice education for more vocational teachers. Realizing that travel time for the teacher educator is often a great factor in determining costs and the number of teachers that may be served, the investigators selected a remote feedback technique which used an audio tape recording of the teacher educator's suggestions for the teacher. Therefore, the teacher could view the videotape of his teaching session, send it to the teacher educator, and receive the recorded comments of the teacher educator via audio tape recording.

SELECTION OF PARTICIPANTS

Teacher educators. The two teacher educators who participated in the study were graduate research associates at The Center. Each person had a master's degree and a minimum of seven years' teaching and two years' supervisory experience.

Teachers. Twelve teachers, representing the vocational service areas of agricultural, business and office, home economics, and trade and industrial education, were selected from a population of volunteers in The Ohio State University area, recruited from undergraduate classes in teaching methods (a course required prior to student teaching) in all vocational services except trade and industrial education. The trade and industrial teachers were recruited from the ranks of teachers with less than three years of public school teaching experience, who had gone into teaching directly from industry, and had had no college preparation except in professional education. The participating teachers all signed a legal waiver permitting The Center to use the video recordings for instructional purposes.

Students. Twenty-four high school students at the eleventh- and twelfth-grade level, contacted through high school guidance counselors, were employed for the study. The criteria for their selection specified that they be at either grade level and have a record of good conduct and citizenship. Before they were employed, they were required to sign a legal waiver allowing The Center to use the video recordings for instructional purposes.

Panel of judges. An independent two-member panel of judges was utilized to rate the teachers' performances by viewing the video recordings of all teaching sessions and completing the critique forms. Two teacher educators in vocational education served as the judges in this study.

SCHEDULE OF OPERATION

The schedule for three weeks of data collection began with the first teaching session (pretest), which provided the teacher the opportunity to become acquainted with the organizational procedures and physical surroundings. It also provided data on the teachers' performance prior to their exposure to the instruction and feedback techniques of the study. Since this was a pilot study and members of the staff were building rapport with the teachers, all of the teachers were permitted to see their first video-recorded teaching session; however, they viewed their teaching sessions alone. This viewing was intended to minimize the impact of self-discovery, with its concerns for cosmetic problems and personal mannerisms, before they received instruction.

After the pretest, the teachers were given instruction on the skill of introducing a lesson. This presentation consisted of review of written materials concerning the skill and discussion of each behavior on the critique form. The teachers also evaluated a 16mm motion picture film of a micro-teaching session using the critique form. (The film was obtained from Stanford University.)

The teachers then taught four five-minute lessons, following the micro-teaching process in accordance with their group assignment for a particular variation in the nature of feedback. For each micro-teaching cycle, the teachers prepared a new lesson. A different group of students was provided for the teacher each time he taught.

After all the required teaching sessions for the study were completed, a follow-up questionnaire (See Appendix B) was administered within a week to determine teacher reactions toward the teacher education program feedback techniques and materials.

EXPERIMENTAL AND STATISTICAL DESIGNS

Experimental design. The study was carried out with a repeated measurement research design (See Figure 1). A stratified random method was used to assign the teachers to the three teacher education feedback groups. Stratification was based on equal representation of persons from the different service areas in vocational education.

Group 1	SR	O_1	X_1	O_2	X_1	O_3	X_1	O_4	X_1	O_5
Group 2	SR	O_1	X_2	O_2	X_2	O_3	X_2	O_4	X_2	O_5
Group 3	SR	O_1	X_3	O_2	X_3	O_3	X_3	O_4	X_3	O_5

SR = Stratified randomization of teachers to groups

O_1 = Observation and evaluation of teaching session one (pretest), etc.

X_1 = Treatment 1, etc.

Figure 1. Experimental Design.

Statistical design. The statistical design was a 3 x 4 x 2 (treatment groups x teaching sessions x raters) factorial design with repeated measurement on the last two factors, teaching sessions

and raters (Winer, 1962). For the analysis, a Biomedical BMD-02V computer program was used with a special application to the repeated measurements in the design (Dixon, 1967). Decisions to accept or reject the hypotheses were made at the .05 level of significance.

CONTROLS

Certain controls were followed to reduce bias and make the teaching situation as normal as possible. These controls ranged from simple administrative procedures to the complex feedback procedures.

As one of the controls (stratified assignment of subjects to treatments), the three teacher education feedback groups (treatments) were randomly assigned an equal number of persons from each of the four different vocational services.

The two teacher educators were assigned an equal load with each treatment group to balance the effect of their supervisory assistance. Procedures for teacher educators and an agreed upon set of supervisory guidelines were also followed to help eliminate differences in the teacher educators' influence (See Appendix C).

Each time a teacher taught he had a different group of students. This, hopefully, ensured student responsiveness. Other procedures included name cards for the teacher and students to prevent difficulty for the teacher in calling on students, and step-by-step procedures for all participating persons and especially for the teachers to follow when they prepared to teach. These procedures were included to aid the teachers in adapting to the laboratory situation so that they could concentrate upon practicing the teaching skill without having to worry about incidentals such as students' names, etc.

ESTABLISHMENT OF THE TEACHER EDUCATION PROGRAM OBJECTIVE

Through a formal survey of the vocational teacher education department heads of The Ohio State University campus and the vocational research and development specialists at The Center, the priority teaching skill of introducing a lesson was selected as the educational objective for the training and research program.

THE INSTRUMENT

An instrument which could serve as a critique guide and a measuring instrument for the skill of introducing a lesson was

developed (See Appendix A). As indicated in the description of the teacher education feedback techniques, it was necessary to provide a critique of the teaching as part of the educational program. Therefore, the critique form served not only as a guide for instruction of the teacher by the teacher educator, but also as a self-evaluation device for the teacher. In addition, the high school students used this instrument to evaluate the teacher's lesson. Finally, the instrument was used by a panel of judges as a research tool to evaluate the teachers' performance.

The instrument included two scales. The accomplished scale measured whether or not the teacher accomplished the behavior and the degree of accomplishment scale measured the quality of the performance. The instrument was developed through a process of a review of the literature and critical analyses by the project staff. Several teacher educators pretested the instrument by evaluating video-recorded and 16mm motion picture films of teaching sessions, recommended improvements, and then tested the final instrument.

In this study, the instrument was satisfactory and produced a reliability coefficient of .9 between the two panel of judges' ratings of teaching sessions.

As stated previously, four types of raters used the instrument--the teacher, the teacher educator, the high school students, and the panel of judges. The teacher, teacher educator, and high school students were given a written description of the teaching skill of introducing a lesson and allowed to discuss it. After the discussion they evaluated a 16mm motion picture film of a micro-teaching session and compared their evaluations with those previously prepared by the project staff.

The panel was trained in a similar manner; however, the judges evaluated several video-recorded micro-teaching sessions which had been randomly selected from the recordings made during the study. After evaluating each micro-teaching session the judges compared their evaluations with the project staff's evaluations. Once high agreement was reached between the panel of judges' and the project staff's evaluations, the judges began to evaluate all the teaching sessions of the study. The video recordings were randomly played for the judges so that they were unaware of which sessions they were viewing.

EQUIPPING THE LABORATORY

For conducting the program and collecting the data for the study, the following equipment was used:

Video hardware. Two complete video recording systems were used in this study with one system used as a back-up in case of equipment difficulties. Each system consisted of an Ampex Video 7500 Recorder, Ampex CC-324 camera, Cannon C-16 zoom lens, Sampson 7301 tripod, Magnavox 12-inch screen TV monitor for recording, a 23-inch screen Zenith TV receiver for video playback, and a Norelco D109 lavaliere cord-type microphone with an Atlas M12 stand. For lighting, two 10-inch Color-Tran mini-lights with B5-32F 1000 watt quartz lights were used.

In addition to the complete back-up system to ensure collection of data, a maintenance service agreement was obtained which provided repairs or temporary replacement of a system within 24 hours.

Laboratory furniture. The minimum essentials for setting up the micro-teaching laboratory were: 1) chalk board, 2) music stand for notes, 3) table for teacher equipment and supplies, 4) four student chairs (tablet armchair type), 5) overhead projector, and 6) flip chart.

CHAPTER III

RESULTS

The results of the data collection and analysis are presented in this chapter. Included are findings relative to the teachers' performance on the skill of introducing a lesson while experiencing the three different teacher education feedback techniques, the teachers' reactions to their experience, and the investigators' informal observations.

TEACHERS' PERFORMANCE

The data on the teachers' performance were collected by evaluating the video-recorded teaching sessions with the critique form for the skill of introducing a lesson (See Appendix A). The ratings by the panel of judges and by the teacher educators were used in the statistical tests. The raters' scores were derived from the two scales on the instrument. The accomplished scale was scored with zero (0) for did not accomplish and with one (1) if the behavior was accomplished. The degree of accomplishment scale was scored with zero (0)--did not accomplish, one (1)--very poor, two (2)--poor, three (3)--average, four (4)--good, and five (5)--excellent.

Before making the final selection of the method for analysis, the teachers' performance data from the three feedback groups on teaching session one (pretest) were subjected to an analysis of variance test. Since there were no significant statistical differences in the mean scores of the three feedback groups on teaching session one, the data met the requirements for analysis of variance for the statistical testing of the mean performance scores of the three feedback groups on teaching sessions two to five. Teaching session two was an initial lesson and teaching session three was a reteaching session for the same lesson. Teaching session four was a new lesson and teaching session five was a reteaching session for that lesson.

Comparative Merits of the Teacher Education Feedback Techniques

The major question pursued in this study (What are the comparative merits of the three teacher education feedback techniques?)

led the investigators to develop seven null hypotheses to be tested within the framework of the statistical design selected.

1. There are no significant statistical differences in the mean performance scores over the series of four teaching sessions for the three teacher education feedback groups.
2. There are no significant statistical differences among the scores for teaching sessions two to five for all teachers in the combined feedback groups.
3. There are no significant interactions among the three teacher education feedback groups and the four teaching sessions (i.e., a certain combination of teaching session and teacher education feedback group will not result in a significant difference in mean performance scores).
4. There are no significant differences in the mean performance scores of the feedback groups as measured separately by the teacher educators or the panel of judges.
5. There are no significant interactions among the three feedback groups and two types of raters over the four teaching sessions (i.e., no combination of these two factors produced significantly different mean performance scores).
6. There are no significant interactions among the four teaching sessions and two types of raters (i.e., no combination of these two factors produced significantly different mean performance scores).
7. There are no significant interactions among the three feedback groups' scores, two types of raters, or four teaching sessions (i.e., no particular combination of these three factors produced significant differences in mean performance scores).

The teachers' mean performance scores referred to in each of the statements of null hypotheses were the accomplished scale and degree of accomplishment scale scores of the teachers on their skill in introducing a lesson, as measured by the panel of judges.

Null hypothesis number one. The question of whether one feedback group performed better than another over the series of four teaching sessions was answered by testing the first null hypothesis. No significant differences were found among the three teacher education feedback groups' accomplished scale or degree of accomplishment scale mean scores (on the teaching skill of introducing a lesson) over the four teaching sessions (See Tables 1 and 2, Source A). Therefore, the null hypothesis was accepted. However, performance curves were plotted for the mean scores derived from the teacher educators' and panel of judges' ratings. Since the curves for both types of raters were similar, the panel of judges' ratings were the only ones used in this analysis (See Figures 2 and 3).

TABLE I

Analysis of Variance
Teachers' Accomplished Scale Mean Scores
Panel of Judges' and Teacher Educators' Combined Ratings

Source	S.S.	d.f.	M.S.	F
A	.116	2	.058	.82
Error	.636	9	.071	
B	.916	3	.305	5.35***
AB	1.257	6	.210	3.30**
C	.082	1	.082	1.82
Error	1.526	27	.057	
AC	.030	2	.015	.33
Error	.409	9	.045	
BC	.018	3	.006	.27
ABC	.136	6	.023	1.09
Error	.593	27	.022	

A = Treatment Groups 1, 2 and 3
B = Teaching Sessions 2, 3, 4 and 5
C = Raters (Teacher educators and panel of judges)
**Significant at .025 level
***Significant at .01 level

TABLE 2

Analysis of Variance
Teachers' Degree of Accomplishment Scale Mean Scores
Panel of Judges' and Teacher Educators' Combined Ratings

Source	S.S.	d.f.	M.S.	F
A	5.63	2	2.815	1.59
Error	15.88	9	1.764	
B	15.88	3	5.293	6.36****
AB	14.24	6	2.373	2.85*
C	6.77	1	6.770	5.72**
Error	22.47	27	.832	
AC	.79	2	.395	.34
Error	10.65	9	1.183	
BC	.62	3	.207	.77
ABC	1.43	6	.238	.89
Error	7.19	27	.266	

A = Treatment groups 1, 2 and 3
B = Teaching sessions 2, 3, 4 and 5
C = Raters (Teacher educators and panel of judges)
*Significant at .05 level
**Significant at .025 level
****Significant at .005 level

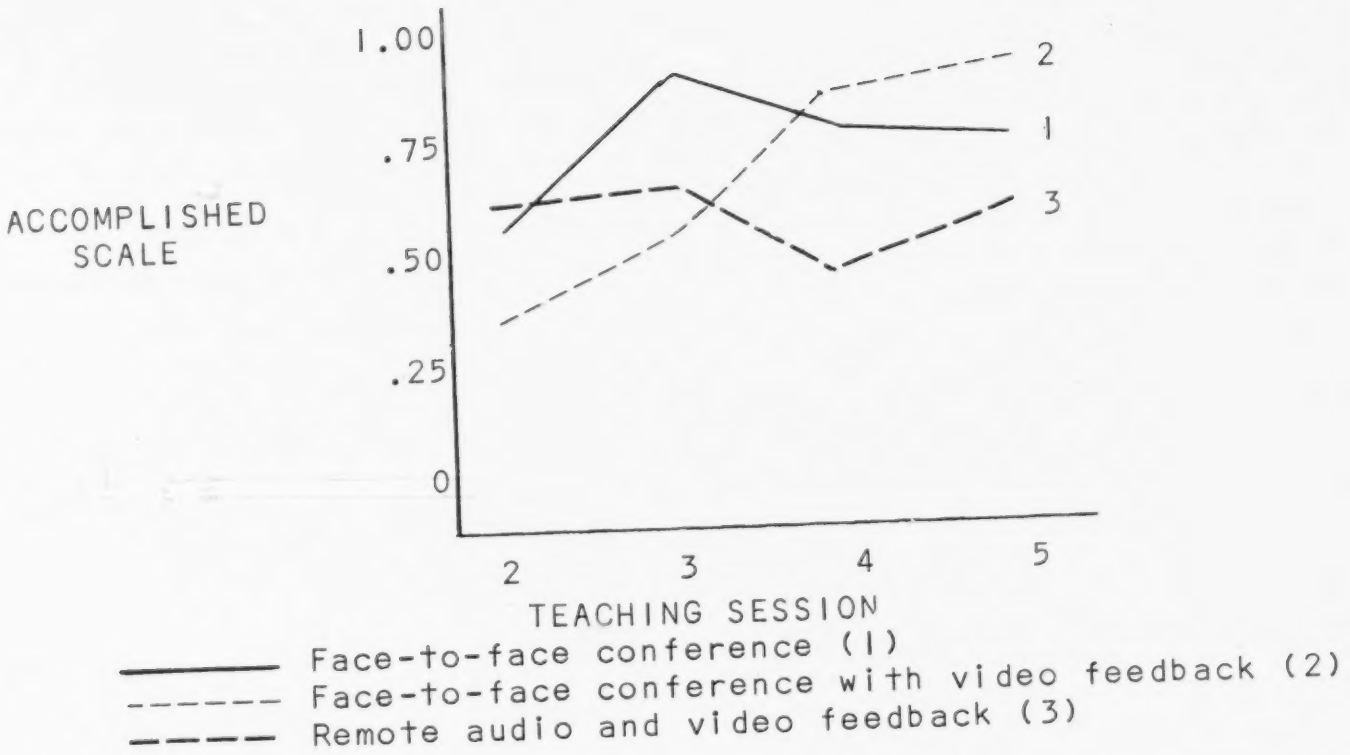

Figure 2. Performance Curves, Accomplished Scale Mean Scores, Panel of Judges' Ratings.

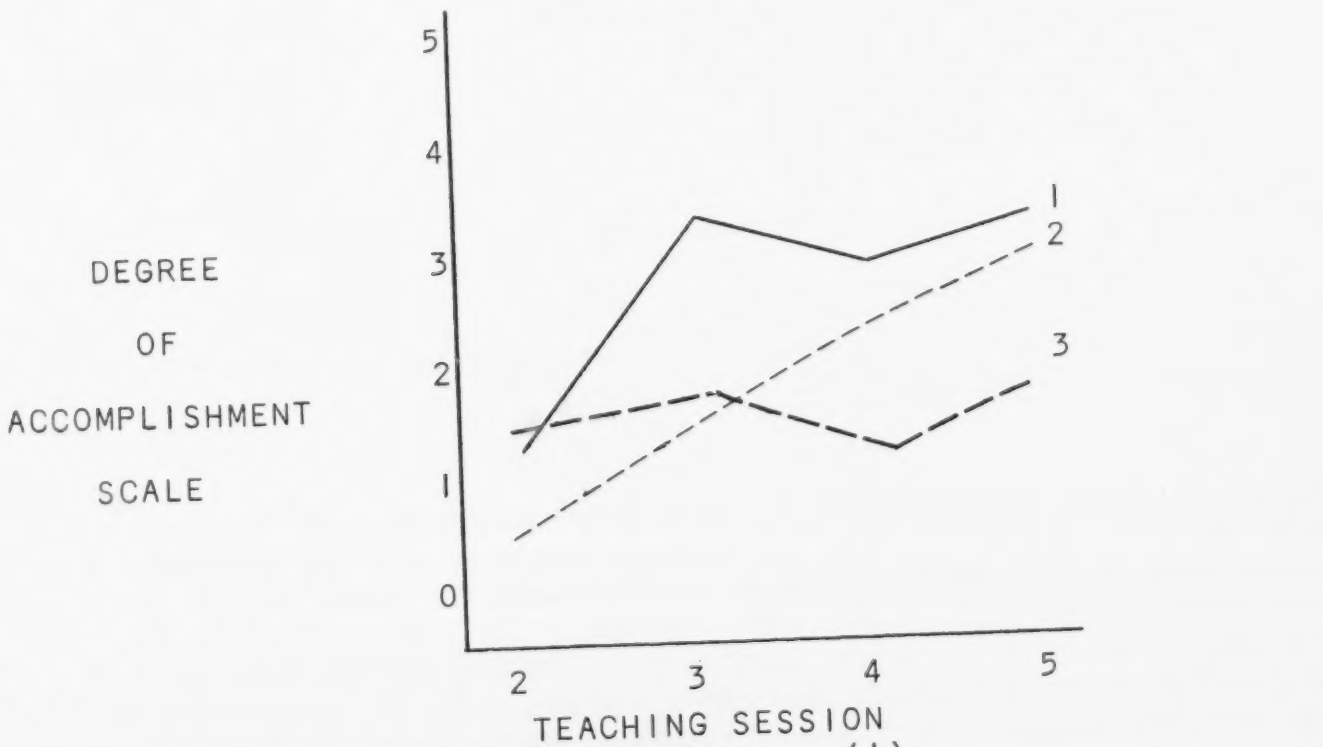

Figure 3. Performance Curves, Degree of Accomplishment Scale Mean Scores, Panel of Judges' Ratings.

Examination of these performance curves indicated great differences in mean performance scores occurred on teaching sessions two and three, particularly on the degree of accomplishment scale mean scores (See Figure 3). An analysis of variance test was performed on the panels' rating of the degree of accomplishment scale mean scores. From this test (See Table 3) it was learned that there were significant statistical differences, at the .01 level, in the mean performance scores of the three feedback groups on teaching session three only.

TABLE 3

Analysis of Variance
Degree of Accomplishment Scale Mean Scores
Panel of Judges' Ratings

Teaching Session	Source	S.S.	d.f.	M.S.	F
2	Between Groups	1.195	2	598	1.163
	Within	3.298	9	.366	
3	Between Groups	6.233	2	3.116	13.148***
	Within	2.132	9	.237	
4	Between Groups	3.303	2	1.651	1.991
	Within	7.461	9	.829	
5	Between Groups	1.670	2	.835	.894
	Within	8.404	9	.934	

***Significant at .01 level

Therefore, in the comparison of the mean performance scores of teachers in the three groups it was found in this situation that the group receiving face-to-face conference without video feedback out-performed the other two groups. It is difficult to explain why the face-to-face conference group performed better than the others on teaching session three. It is possible that the two groups receiving video feedback were more concerned about observing and improving behaviors other than those concerned with the teaching skill of introducing a lesson which were rated in this study. The fascination of seeing one's self and detecting mannerisms previously unknown to the individual are among the possibilities.

Null hypothesis number two. Testing this hypothesis provided answers to the question of whether the mean performance scores of the teachers in the combined feedback groups differed significantly among teaching sessions two to five. There were significant statistical differences found on both types of scores. Differences were detected among the accomplished scale mean scores at the .01 level of significance (See Table 1, Source B) and on the degree of accomplishment scale mean scores at the .005 level of significance (See Table 2, Source B). Consequently, the null hypothesis was not accepted. A comparison of the mean performance scores for the teachers in the combined feedback groups indicated that the greatest differences on both scales occurred between teaching sessions two and five.

Null hypothesis number three. "Did certain combinations of feedback groups and teaching sessions result in differences in mean performance scores?" was the question to be answered by testing this null hypothesis. Significant differences were found in terms of the interactions for the accomplished scale mean scores at the .025 level (See Table 1, Source AB) and for the degree of accomplishment scale mean scores at the .05 level (See Table 2, Source AB). Examination of the performance curves (See Figures 2 and 3) indicated the most likely source of the interaction to be the teaching session four mean scores wherein the groups of teachers experiencing the face-to-face conference with video feedback increased their mean scores over teaching session three, while the teachers in the other two feedback groups decreased their mean performance scores. The null hypothesis was not accepted in this instance because there were statistically significant interactions. While only a brief series of teaching sessions was conducted in this study, it is interesting to note that the face-to-face conference with video feedback group tended to steadily increase its scores from teaching session two to five (See Figures 2 and 3). On the other hand, the other two feedback groups had a consistent pattern of increasing scores on teaching sessions three and five, as compared with lower scores on teaching sessions two and four, and ending with scores on teaching session five lower than their performance on session three. The reader should be reminded that the teachers in all groups prepared a new lesson with different technical content between teaching sessions three and four. While they continued to work on the skill of introducing a lesson it would not be difficult to explain the performance scores on teaching session four being lower than three because of their concern with introducing and teaching a new lesson. Why the face-to-face conference with video feedback group did not experience this performance pattern is difficult to explain. Perhaps the combination of video feedback and the face-to-face conference will produce better performance than either of these types of feedback being used separately. The series of teaching sessions and the number of teachers in this study were too small, however, to supply sufficient evidence. The remote audio with

video feedback technique tended to provide the poorest performance experienced in this study. The comparative data on the scoring of that group tended to indicate that this form of teacher education feedback was not very promising; however, the differences in the mean performance scores in this case were not statistically significant on the final teaching session (See Table 3).

Null hypothesis number four. Testing this hypothesis produced an answer to the question of whether there were significant differences in the mean performance scores of the teachers in the three feedback groups as measured separately by the teacher educators or the panel of judges.

No differences were found in the accomplished scale mean scores (See Table 1, Source C) but a statistically significant difference was found (.025 level) in the degree of accomplishment scale mean scores (See Table 2, Source C).

A comparison of the performance curves resulting from the degree of accomplishment scale ratings by the teacher educators (See Figure 4) and the degree of accomplishment scale ratings by the panel of judges (See Figure 3) indicated that the rating trends were the same for the two types of raters. However, the teacher educators rated the teachers' performance consistently higher for all teaching sessions. The significantly different mean scores for the two types of raters were thereby understood. Why were there no statistically significant differences in scoring by the two types of raters on the accomplished scale scores?

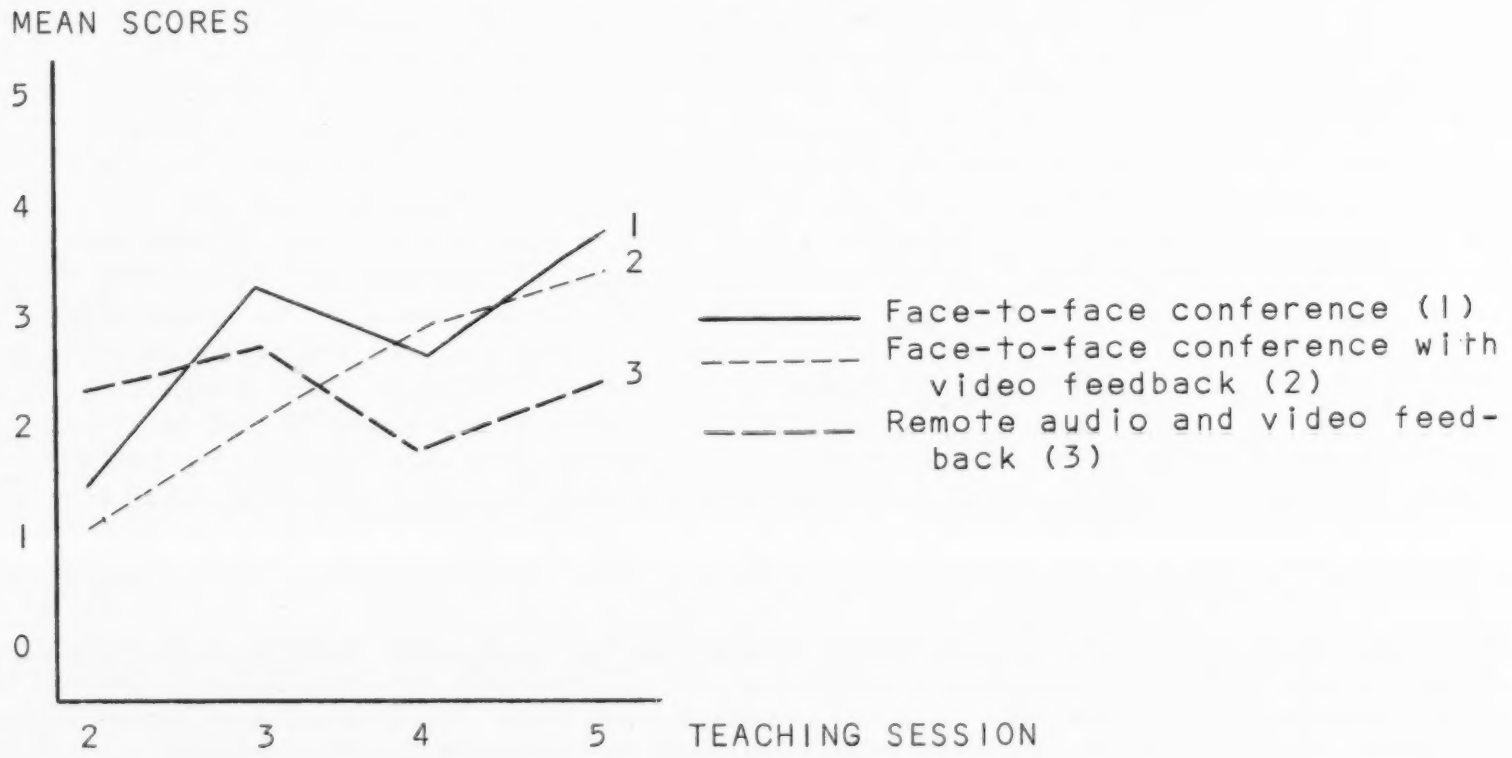

Figure 4. Performance Curves, Degree of Accomplishment Scale Mean Scores, Teacher Educators' Ratings.

The nature of the observation required for the two types of scores might give the answer. It would seem logical that there should be higher agreement among raters for the accomplished scale scores since the rater is required to determine only whether or not the teacher engaged in a particular behavior required in the skill of introducing a lesson. On the other hand, determining the quality of performance for a particular behavior, as in the degree of accomplishment scale scoring, would be more difficult and subjective for the raters and less likely to produce high agreement among the raters. While the null hypothesis was not accepted since significant differences were found between the scoring of the two types of raters, the rating trends were the same for the more subjective of the two types of scores, i.e., degree of accomplishment scale. The differences, therefore, had no practical significance. The fact remains, however, in this case, the rating trends of the panel of judges and teacher educators were the same but the teacher educators' ratings were consistently the higher of the two.

Null hypothesis number five. "Were there significant interactions among the feedback groups and the two types of raters over the four teaching sessions?" was the question answered by testing the fifth null hypothesis. There were no significant interactions found for either type of scores (See Tables 1 and 2, Source AC). The fifth null hypothesis was accepted. That is, there was no rater bias (significant change in the ratings of teacher educators and panel of judges) in rating teacher performance in certain treatment groups across the four teaching sessions. While there was a difference in scoring, the rating trend of the two types of raters remained consistent as discussed under null hypothesis number four.

Null hypothesis number six. "Did rater bias exist in rating teachers' performance on certain teaching sessions?" was the question answered by testing the sixth null hypothesis. There were no significant interactions among types of raters for the performance of feedback groups on certain teaching sessions in the series (See Tables 1 and 2, Source BC). The sixth null hypothesis was accepted since no particular combination of the factors resulted in differences in mean performance scores.

Null hypothesis number seven. "Did any combination of factors (feedback group, type of raters, or teaching sessions) produce a difference in the teachers' performance scores?" was the question answered by testing the seventh null hypothesis. No significant interactions were identified (See Tables 1 and 2, Source ABC). The null hypothesis was accepted since no particular combination of the three factors resulted in differences in mean performance scores.

Summary of Findings on Teachers' Performance

Interpretation of the statistical testing of the teachers' performance data, generated by an evaluation of each of the three groups of teachers on each of five teaching sessions by two types of raters (teacher educators and a panel of judges) resulted in the following findings: 1) there were no significant differences in mean performance scores among the three groups of teachers, with each experiencing a different teacher education feedback technique, across the series of teaching sessions; 2) there was a significant difference in mean performance scores among the three feedback groups of teachers only on teaching session three; 3) significant differences were found among teaching sessions in a comparison of the combined feedback groups' mean performance scores on both scales (the greatest differences occurred between teaching sessions two and five); 4) there were significant differences in the degree of accomplishment scale mean scores given the three teacher education feedback groups over the series of teaching sessions by the two types of raters, i.e., the scores given by the teacher educators were consistently higher than those given by the panel of judges; 5) the trend pattern of the mean performance scores given by the two types of raters was the same for each teaching session; and 6) there was a significant interaction between teaching sessions and treatment groups, i.e., the face-to-face conference with video feedback group continued to increase its scores from teaching sessions three to four while the other two feedback groups decreased their scores on the same teaching sessions.

TEACHERS' REACTIONS

After the participants had completed the series of teaching sessions, the teachers were asked to complete a questionnaire (See Appendix B) designed to obtain their reactions to the teacher education program which they had experienced. The percentage of scores classified from "high to low" (1-4) were calculated for each item in the instrument (See Table 4).

Item one concerning the teachers' understanding of their role in the teacher education program was rated "very well" by 42.9 percent (1) and "fairly well" by 57.1 percent (2) of the respondents.

Item two asked for the teachers' reactions to the value of viewing their first teaching sessions. Most of the respondents, 57.1 percent, rated this item "of great value" (1), and 42.9 percent rated it "of some value" (2). The comments from the teachers indicated that it was shocking at first to discover how they looked to others.

Item three asked for the teachers' appraisal of teaching high school students as opposed to teaching peers in the micro-sessions. The response was 57.1 percent "of great value" (1) and 42.9 percent

TABLE 4

Teachers' Ratings of Questionnaire Items*

Items	Ratings: High 1	2	3	Low 4
1	42.9	57.1		
2	57.1	42.9		
3	57.1	42.9		
4	14.3	42.9	28.6	14.3
5	28.6	71.4		
6	100.0			
7	71.4	28.6		

*Based on seven responses from 12 teachers

"of some value" (2). The comments were varied but indicated generally that the micro-class with high school students was more like the real teaching situation than was teaching peers.

Item four was concerned with the values of the teacher-student get-acquainted period, a few minutes of "warm-up" before each teaching session. The reactions of the respondents were 14.3 percent "of great value" (1), 42.9 percent "of some value" (2), 28.6 percent "of minimal value" (3), and 14.3 percent "of no value" (4). It was obvious that nearly half of the teachers regarded the get-acquainted period as being of minimal or no value.

Item five was concerned with the adequacy of the instruction provided the teachers on the skill of introducing a lesson. The ratings were 28.6 percent "very adequate" (1) and 71.4 percent "fairly adequate" (2). The teachers' comments indicated that they believed more examples and suggestions, especially visual examples, were needed in the presentation on the teaching skill of introducing a lesson.

Item six asked the teachers to appraise the value of the feedback sessions in helping them plan to improve the skill of introducing a lesson in subsequent lessons. They responded with 100 percent "of great value" (1), regardless of which teacher education feedback technique they received.

Item seven asked the respondents to indicate the value of the teaching experience provided in the simulated teacher education program as a part of their total preparation for teaching.

Most of the respondents (71.4 percent) rated this experience "of great value" (1). The remainder (28.6 percent) rated it "of some value" (2). The comments indicated that this experience helped the teachers to internalize the skill of introducing a lesson and to realize what improvement was needed; thereby, they believed their skill improvement was more immediate.

The teachers' reaction to item eight, which called for suggestions for improving future simulated teacher education programs, included the following: more teaching sessions, more examples of the skill of introducing a lesson, and an opportunity for personal contact with the teacher educator by those experiencing the remote teacher education feedback.

The teachers' reactions to their experiences were generally quite favorable. With the exception of item four (teacher-student get-acquainted period), the teachers' ratings were at the high end of the scale with scores of 1 and 2 receiving all the attention. The teachers provided some good suggestions for improving the simulated teacher education program.

INFORMAL OBSERVATIONS

Since this was a pilot study, the investigators needed informal observations of the multifaceted activity in the simulated teacher education program. For the convenience of readers who may be interested in these observations, they have been organized into the following topics: micro-teaching process, video recording, and developing instructional models.

Micro-teaching process. The investigators found the micro-teaching process to be an efficient means of enabling teachers to practice a teaching skill. The time factor was a slight problem. Preservice teachers adapted easily to the five-minute time restriction. Inservice teachers generally taught more than five minutes on the first teaching session and complained about the restriction but adjusted their teaching time after the second teaching session. A list of possible five-minute lesson topics was given to each teacher at the beginning of the study. This list of topics may have reduced the problem of teachers tending to teach more than five minutes.

One of the major criticisms of micro-teaching has been that it is not real classroom teaching. Some of the teachers in this study voiced this criticism at the beginning of the study, but no one mentioned it at the end of the study. The investigators realized that micro-teaching in a laboratory was not in all respects a "real" classroom situation. The answer lies in the fact that opportunities must be provided for the preservice teacher to practice teaching to develop some confidence and skill before working with a "real" class.

Video recording. For recording and analyzing data on a teacher's behavior, the video playback was found to be excellent; however, it was learned that the video picture should include both the teacher and his students. Students' reactions are often a clue to the effectiveness of a teacher's behavior.

For educating teachers, it was observed that the completeness of the record, both video and audio, for immediate playback was advantageous to both the teacher and teacher educator. This feature permitted clarification of any misunderstandings which resulted from problems in recall.

Developing instructional models. Because instructional models were to be developed for the next study from the video-recorded teaching sessions of the pilot study, legal waivers were obtained from the participating teachers and students. In the preparation of the instructional models, the investigators found that a video-recorded teaching session could be broken into parts to illustrate single or a combination of teaching behaviors. These selections were successfully "dubbed" from an original recording to another videotape. Teachers' lesson plans obtained at the time the teaching sessions were recorded greatly assisted the investigators in the selection of model teaching skills.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

Comparing the relative merits of three teacher education feedback techniques in a simulated teacher education environment as a pretest of feasibility of the techniques and as a pilot study for the project series was a very rewarding educational venture. The experience was adequate to provide an orientation to micro-teaching and video recording application and to the complexities of simulated teacher education programs. The feasibility of the following three teacher education feedback techniques was pilot tested: 1) face-to-face conference, 2) face-to-face conference with video feedback, and 3) remote audio with video feedback. The educational objective of the simulated teacher education program was the teaching skill of introducing a lesson. No significant differences were found in the mean performance scores of the teachers (on the skill of introducing a lesson) in the three different teacher education feedback groups over the five teaching sessions. Teachers experiencing one feedback technique compared favorably with those experiencing the other types of feedback. One important exception was that the teachers in the face-to-face conference with video feedback group continued to increase their scores from session three to four while the other groups decreased their scores on session four. Also, on teaching session three, there were significant differences in the mean performance scores among the three feedback groups, with the greatest difference being between the face-to-face conference with and without video feedback groups, with the former having the highest mean score. The rating trends of the teacher educators and the panel of judges were found to be similar; however, the scores given by the teacher educators were consistently higher than those determined by the panel of judges.

The questionnaire completed by the teachers after the study indicated that they had had generally favorable reactions to their experiences. The investigators found the teachers' suggestions helpful in planning future studies in the series. Informal observations by the investigators were also believed to be helpful in planning future efforts.

CONCLUSIONS

The investigators, being fully aware of the limitations of the pilot study, have stated the following conclusions which were

intended to help guide future laboratory studies:

1. Any one of the three teacher education feedback techniques tested may be as effective as another for helping teachers develop the skill of introducing a lesson.

2. The particular remote feedback technique tested, with minor modifications, may have potential for inservice teacher education application.

3. Combining video feedback with the conventional face-to-face conference in micro-teaching may not increase teachers' performance on particular skills as much or as quickly as educators would desire.

4. All three teacher education feedback techniques were found to be feasible for field testing in ongoing teacher education programs.

RECOMMENDATIONS

The following recommendations were made to guide the investigators in future studies in the series:

1. Additional work on the development of remote feedback techniques should be encouraged. The particular audio feedback technique functioned satisfactorily in this study but the ultimate and desired method of using an audio track of the video recorder should be pursued. The suggested arrangement would eliminate the need for a separate audio recorder and thereby simplify the equipment requirements for all experimental and field applications of the technique.

2. The teachers' request for more instructional models should be honored in future studies of the project. A rigorous search was recommended for model illustrations of teaching behaviors in the videotapes generated through recording the teaching sessions in this and future data collection efforts in the series of studies of the project.

3. It was recommended that only the scores of the panel of judges be used in the statistical tests of future studies.

4. The type of instrument used in this study was recommended for future studies involving the same or different teaching skills. However, simplification of the instrument was urged, i.e., refining the statements of behavior and the rating scale.

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GLOSSARY OF TERMS

Complete lesson. An act of teaching incorporating the four steps of instruction: introduction, presentation, application, and evaluation.

Instructional model. A video recording of a complete or partial teaching session which illustrates a teaching skill, e.g., introducing a lesson.

Laboratory conditions. An environment designed to simulate a vocational and technical teacher education program, e.g., a teacher teaching in his own classroom or laboratory, being observed by a teacher educator, and receiving feedback.

Micro-teaching. A scaled-down teaching session, five to 10 minutes of teaching to four or five students, in which the teacher participates in the full sequence of the micro-teaching cycle: plan, teach, critique (feedback), replan, reteach, critique.

Pretest. The first teaching session in this study. This teaching session was used to allow the teachers to become acquainted with the physical facilities and procedures. Also, this session was used to determine the teachers' capabilities prior to involvement in the study.

Video feedback. The procedure used in the study which involved preparing videotape recordings of all participants' teaching sessions to provide opportunities for the teacher educators and teachers to view a replay of the teaching session.

APPENDICES

APPENDIX A

CRITIQUE FORM

INTRODUCING A LESSON

The introduction phase of a lesson "sets the stage" for your participation in the activity which is to follow. The introduction should help inspire you to want to accomplish the objectives of the lesson.

The following items will be used by you to evaluate your teacher's teaching. If the teacher did not accomplish an item, you will only mark "Did Not Accomplish." If the teacher did accomplish the item, you will mark "Accomplished" and then mark the column which describes how well the teacher "accomplished" the item.

DID NOT ACCOMPLISH	ACCOMPLISHED	DEGREE OF ACCOMPL.				
		VERY POOR	POOR	AVERAGE	GOOD	EXCELLENT

Did the Teacher in the Introduction:

1. State specifically what the objective/s of the lesson were in terms of my behavior? (For example: Did the teacher tell you that the objective of the lesson was for you to be able to write, speak, list, identify, compare, solve, construct, contrast, etc.?)

2. State why the objective/s were important in terms of my needs? (For example: Did the teacher state that the objective was important for you to learn because of safety reasons, a future job, recreation, understanding yourself, understanding others, etc.?)

3. State how I would proceed in accomplishing the objective/s of the lesson? (For example: Did the teacher state what you were to do in order to learn the objectives of the lesson? Examples are: read certain material, practice using certain tools, solve certain problems, etc.?)

	DID NOT ACCOMPLISH	ACCOMPLISHED		DEGREE OF ACCOMPL.				
				VERY POOR	POOR	AVERAGE	GOOD	EXCELLENT
4. Give me sufficient information concerning the lesson so that I could interpret the objectives in my own terms? (For example: Were you able to state the objectives of the lesson without difficulty? Were you able to understand what was meant about the objectives without difficulty?)								
5. Relate the lesson to my prior knowledge or experience? (For example: Did the teacher arouse my curiosity and interest in the lesson by relating the lesson to my previous knowledge or past experience?)								
6. React favorably toward my questions, answers and comments? (For example: Did the teacher give attention and consideration to my questions, answers and comments?)								
7. Provide opportunity for my response and participation? (For example: Did the teacher allow you the opportunity to ask questions, make comments or participate in class activities?)								
8. State how I would know when I had achieved the objective/s of the lesson? (For example: Did you know what you should be able to do in order to prove that you had achieved the objective/s of the lesson?)								
9. Help me to acquire an interest in the lesson? (For example: Did you want to learn what was to be presented in the lesson?)								
10. Express enthusiasm in the lesson? (For example: Did the teacher express enthusiasm by speech and physical gestures and give extra facts or stories concerning the nature or importance of the lesson, etc.?)								

	DID NOT ACCOMPLISH	ACCOMPLISHED		DEGREE OF ACCOMPL.				
				VERY POOR	POOR	AVERAGE	GOOD	EXCELLENT

11. Use instructional aids which helped me to become interested in the lesson? (For example: Did the teacher use the chalkboard, charts, drawings, lists, maps, etc.?)

Comments: (What can the teacher do to improve his introduction of the lesson?)

Average (Mean) ☐ ☐

Teacher _____ Date ___/___/___
Mo. Day Year

Observer_____

APPENDIX B

TEACHER QUESTIONNAIRE

Please comment on each item.

1. As a result of the first orientation to micro-teaching and videotape recording, did you understand what it was you were expected to do as a prospective participant?

☐ Very Well ☐ Fairly Well ☐ Uncertain ☐ Not at all

What are your suggestions for future orientation? _____

_____

2. Do you think the teaching and viewing of your first lesson without previous explanation from us on how to teach was a valuable experience?

☐ Of great value ☐ Of some value ☐ Of minimal value ☐ Of no value

What did you learn from the first lesson? _____

_____

3. Do you feel that teaching students from the level you are planning to teach is of greater value than the teaching of peers in methods classes?

☐ Of great value ☐ Of some value ☐ Of minimal value ☐ No difference

Why? _____

4. Do you feel that the background information on the students and the get-acquainted period was of benefit for your teaching encounter?

☐ Of great value ☐ Of some value ☐ Of minimal value ☐ Of no value

What else could be done? _____

40/41

5. Do you feel that the skill presentation on _____ was adequate in explaining this teaching skill?

☐ Very adequate ☐ Fairly adequate ☐ Adequate ☐ Inadequate

How could we improve? _____

_____

6. Were the supervisory sessions of value in helping you replan the lesson to better attain the teaching skill?

☐ Of great value ☐ Of some value ☐ Of minimal value ☐ Of no value

How could the supervisor improve technique? _____

_____

7. As a part of your total preparation for teaching, was this teaching experience of value?

☐ Of great value ☐ Of some value ☐ Of minimal value ☐ Of no value

In what way? _____

8. Please give any other suggestions that you have for our planning future simulated teacher education programs.

APPENDIX C

PROCEDURES FOR TEACHER EDUCATORS

Face-to-Face Conference (Treatment Group 1)

1. Observe the teacher during the teaching session.
2. Make notes on no more than two points for teacher improvement during the next teaching session.
3. Complete the critique form immediately after the teaching session.
4. Collect the critique forms from the students.
5. Collect the critique form from the teacher.
6. Collect the cover sheet from the video recorder operator.
7. Staple all forms together in the following order:
   A. Cover sheet
   B. Teacher educator
   C. Teacher
   D. Students
8. Review notes and critique forms to decide on definite points for improvement.
9. Have conference with the teacher.

Face-to-Face Conference with Video Feedback (Treatment Group 2)

1. Observe the teacher during the teaching session.
2. Make notes on no more than two points for teacher improvement during the next teaching session.
3. Complete the critique form immediately after the teaching session.
4. Collect the critique forms from the students.
5. Collect the critique form from the teacher.

6. Collect the cover sheet from the technician.

7. Staple all forms together in the following order:

   A. Cover sheet

   B. Teacher educator

   C. Teacher

   D. Students

8. Review notes and critique forms to decide on definite points for improvement.

9. View video recording with teacher during conference.

10. Analyze the teaching session and confer.

Remote Audio and Video Feedback (Treatment Group 3)

1. View video recording of the teaching session.

2. Make notes on points for teacher improvement while viewing the recording.

3. Complete the critique form.

4. Record comments and critique suggestions on the audio tape recorder.

5. After obtaining the cover sheet and student critique forms from the technician,[1] staple all forms together in the following order:

   A. Cover sheet

   B. Teacher educator

   C. Teacher

   D. Students

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[1]The video recorder operator collects the cover sheet from the teacher and the students' critique forms for this treatment.